

# U.S. Approach to Estimating Fugitive Methane Emissions from Coal Mining



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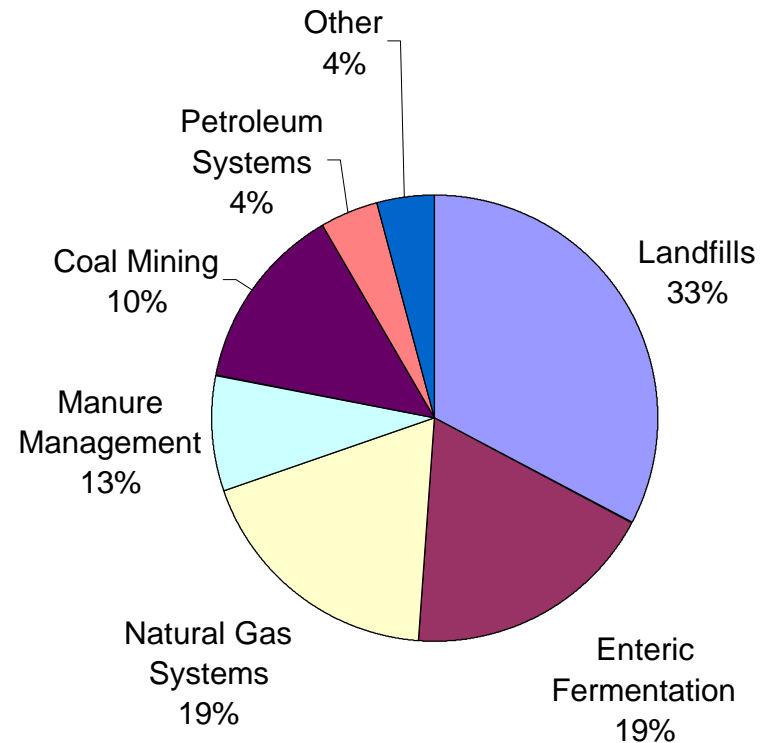
# Outline

- Overview
- Methodologies - General
- Methodologies - U.S. Approach
- Conclusions

# U.S. Methane Emissions from Coal Mining

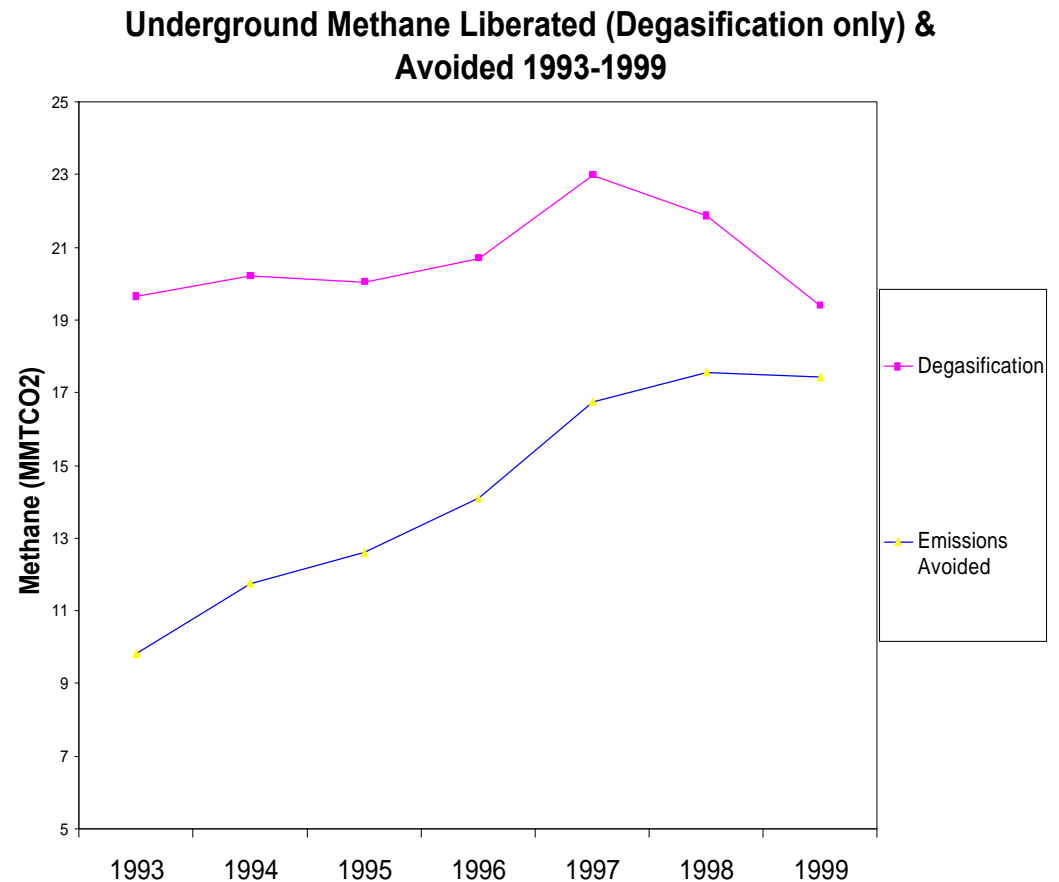
- “Key” Source 1990-8
- Coal Mining 10% of Methane Emissions in 1998
- Decreased 25% since 1990
  - Increased recovery
  - Reduced production

**Methane Emissions in the U.S. in 1998**



# Increased Recovery & Use

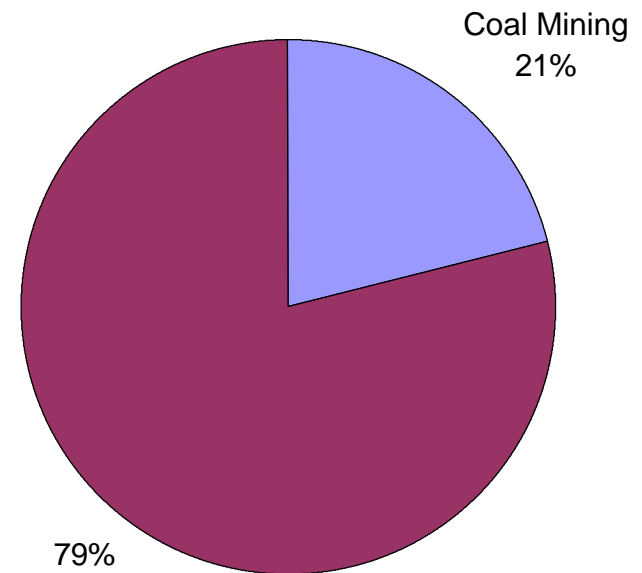
- Despite recent decrease in:
  - degasification systems
  - coal production
- Increase in recovery & use



# Polish Emissions from Coal Mining

- Coal Mining 21% of Methane Emissions in 1998
- Second largest methane source behind landfills

**Methane Emissions in Poland in 1998**



Poland 2000 inventory submission to U.N.

# General IPCC Methodology

- General approach to emissions:
  - Emissions = Activity Data \* Emission Factor
  - Measurements
    - Direct for Tier 3 underground coal mining
    - Specific activity data and emission factors

# General IPCC Methodology

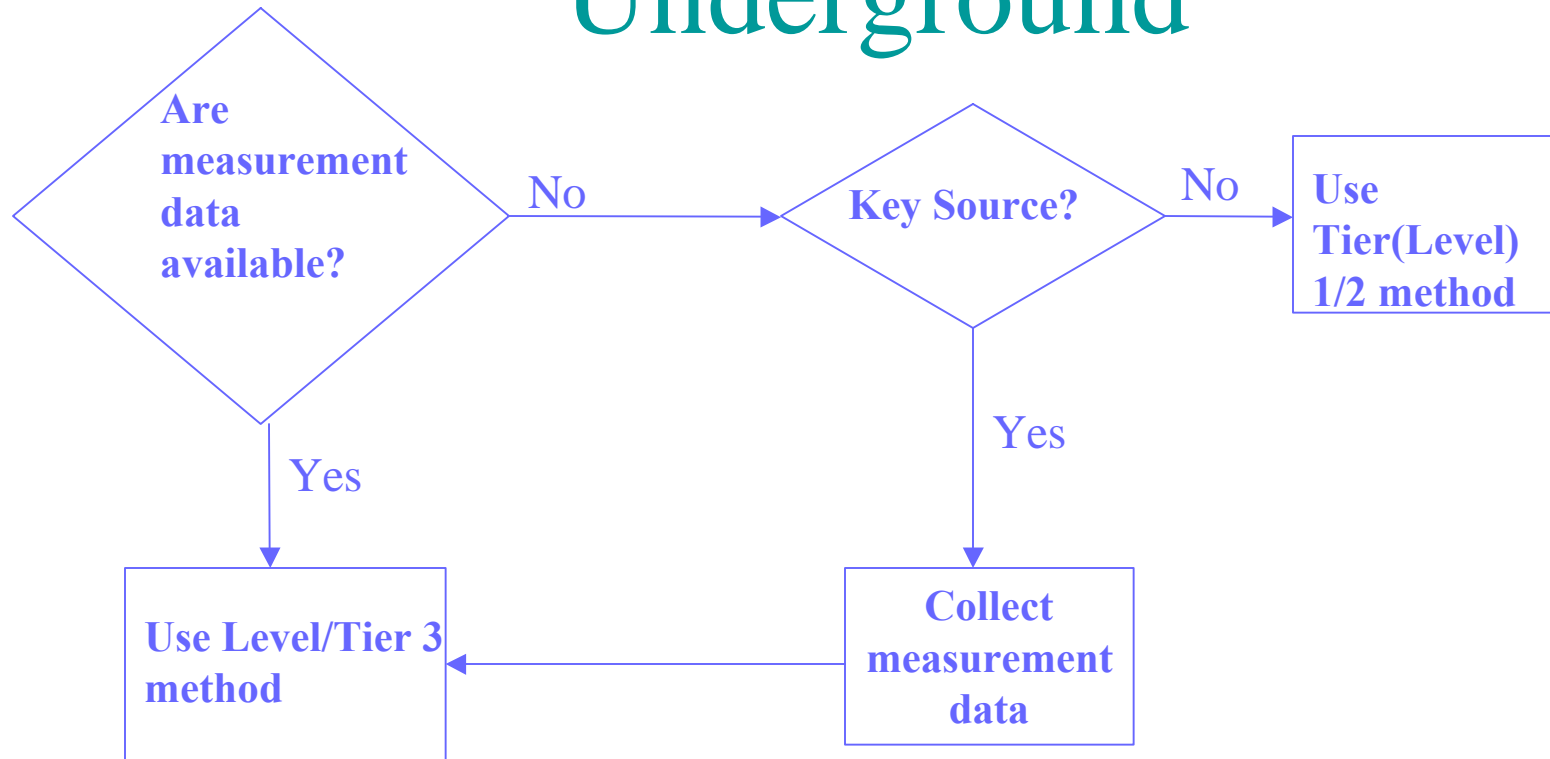
- Emissions = **Underground** (*Ventilation + Degasification - Recovery & Use*) + **Surface** + **Post** (*Underground & Surface*)
- Good Practice Guidelines further assist countries in preparing inventories

# Good Practice

- Key Source: Significant in level of emissions, trend in emissions, or both
  - **Should spend more time & resources than for minor sources (e.g. rice)**
- Coal mining is a key source for U.S. & Poland



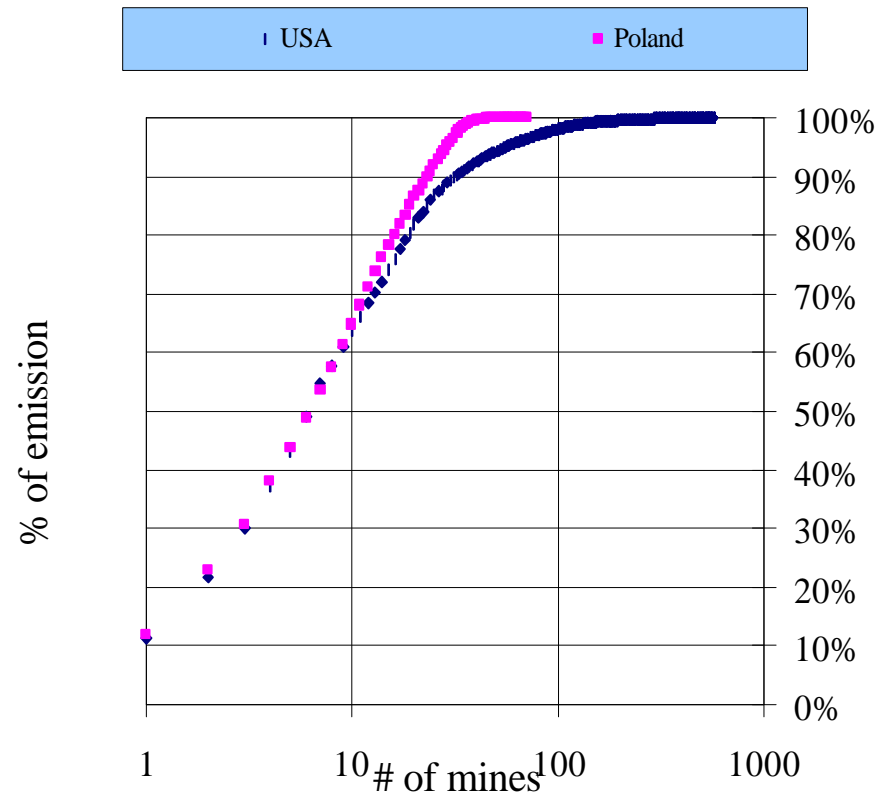
# Methodological Choice - Underground



# Underground Emissions

- Poland - Top 20 of mines account for ~ 90% of emissions
- Prioritize measurements at gassy mines

Distribution of Emissions from US (1997), Polish (1988) Underground Mines



# U.S. General Methodology

- Coal estimates are key (priority):
  - Use IPCC Tier 2/3 - Good Practice Recommendation
  - Underground - 64% of U.S. emissions - Tier 3 - mine specific
  - Surface & Post - Tier 2 - highest Tier for these sub-sources

# Underground - Ventilation

- **Ventilation Systems - Tier 3**
  - Methane required to be vented for safety reasons
  - Mine-specific quarterly readings from ventilation systems (mines  $>.1$  mcf/day)
  - Extrapolate for all mines (minor)
- **Key issue - data availability**
  - Work with other agency to obtain data

# Underground - Degasification

- **Degasification Systems:**
  - Wells drilled to remove large volumes of methane before or after mining
  - Many large coal mines use to prevent high methane concentrations - stop work conditions
  - Data Availability -
    - Mine safety agency notes only if system present at a mine
    - Work with industry and/or states

# Underground - Degassing

- Use available data - ventilation emissions
- Estimation by mine:

$$Degasification = \frac{Ventilation\_Emissions}{\%\_of\_total} - Ventilation\_Emissions$$

- Two methods for determining % emissions:
  - Obtain data directly from operators
  - Make assumptions based on type of system
    - For those employing gob wells or horizontal boreholes assume degassing emissions account for 40% of total methane liberated

# Underground- Recovered & Used

- Twelve mines have recovery & use projects
  - sell gas recovered from degasification systems
- Key issues
  - Data availability:
    - Public information on gas sales from some states
    - Voluntarily reported mine specific information
  - Count in year coal mine seamed
    - work with operators

# Surface & Post Mining

- Mine - specific data not available
  - Use General IPCC formula:
    - *Coal production \* Emission Factor/ton of coal produced*
  - Key (priority) Source:
    - **Use Tier 2-** Good Practice Recommendation
    - Basin Specific Production and Emission Factors supported by measurement
      - Surface mining - 2 times in situ methane content
      - Post - 32.5% of in situ methane content



# Conclusions

- Working with other agencies and industry has improved estimation
  - Direct measurement where feasible
  - Expert/industry input when needed

# Conclusions

- Coal mining continues to be a priority for the U.S.
  - ensuring consistency with Good Practice Guidelines (*[www.ipcc.ch](http://www.ipcc.ch)*)